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A Fermi Degenerate Gas of Ground State Polar Molecules LUIGI DE MARCO, GIACOMO VALTOLINA, KYLE MATSUDA, WILLIAM TOBIAS, JILA – University of Colorado, Boulder, JACOB COVEY, California Institute of Technology, JUN YE, JILA – University of Colorado, Boulder — Ultracold polar molecules provide unheralded opportunities for exploring many-body physics and especially for emulating spin systems that go beyond nearest-neighbor interactions. In particular, owing to the large molecular electric dipole moment, the long-range dipole-dipole force allows us to investigate phenomena where the complex interplay between disorder and interaction strength dominates the system's dynamics and gives rise to novel quantum phases. While low-entropy samples have been produced in a 3D lattice, in this talk, I will present our recent progress towards generating a deeply degenerate gas of polar KRb molecules in two dimensions. In the new generation KRb apparatus at JILA, we have produced in excess of 40,000 ground state molecules in DC electric fields up to 10 kV/cm. By combining such fields with strong optical confinement, we not only stabilize the molecules against chemical reactions, but can also explore efficient evaporative cooling in a 2D configuration. This provides us with a clear path forward to producing a bulk Fermi degenerate gas of polar molecules.

Luigi De Marco
JILA – University of Colorado, Boulder

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